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IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Sir:

Transmitted herewith for filing is the PROVISIONAL APPLICATION

for a patent of Inventor(s):

ANDREW BECK and JOSEPH P. KENNEDY, JR.

Title: SYSTEM AND METHOD FOR DETECTING A MOBILE STATION OPERATING THROUGH A REPEATER

Enclosed are:

[X] A Cover Page and Three (3) pages of specification.

[X] A check in the amount of $160.00 to cover the filing fee.

The Commissioner is hereby authorized to charge payment of any additional fees associated with this communication or to credit any overpayment to Deposit Account No. 04-1679. A duplicate of this sheet is enclosed.

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SYSTEM AND METHOD FOR DETECTING A MOBILE STATION OPERATING THROUGH A REPEATER

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Invention Disclosure: Detection of a Mobile Station Operating through a Repeater

This invention discloses a method to determine if a mobile station operating in a wireless network utilizing a repeater is communicating with the base station through the repeater or through other means. Incorporated as prior art are descriptions of wireless networks supporting voice and data traffic; repeaters used to "repeat" the RF signal to enhance range, coverage or service quality; and mobile appliances attached to the wireless network and used as terminal devices for voice or data interfacing. A typical example of a wireless appliance is a cell phone.

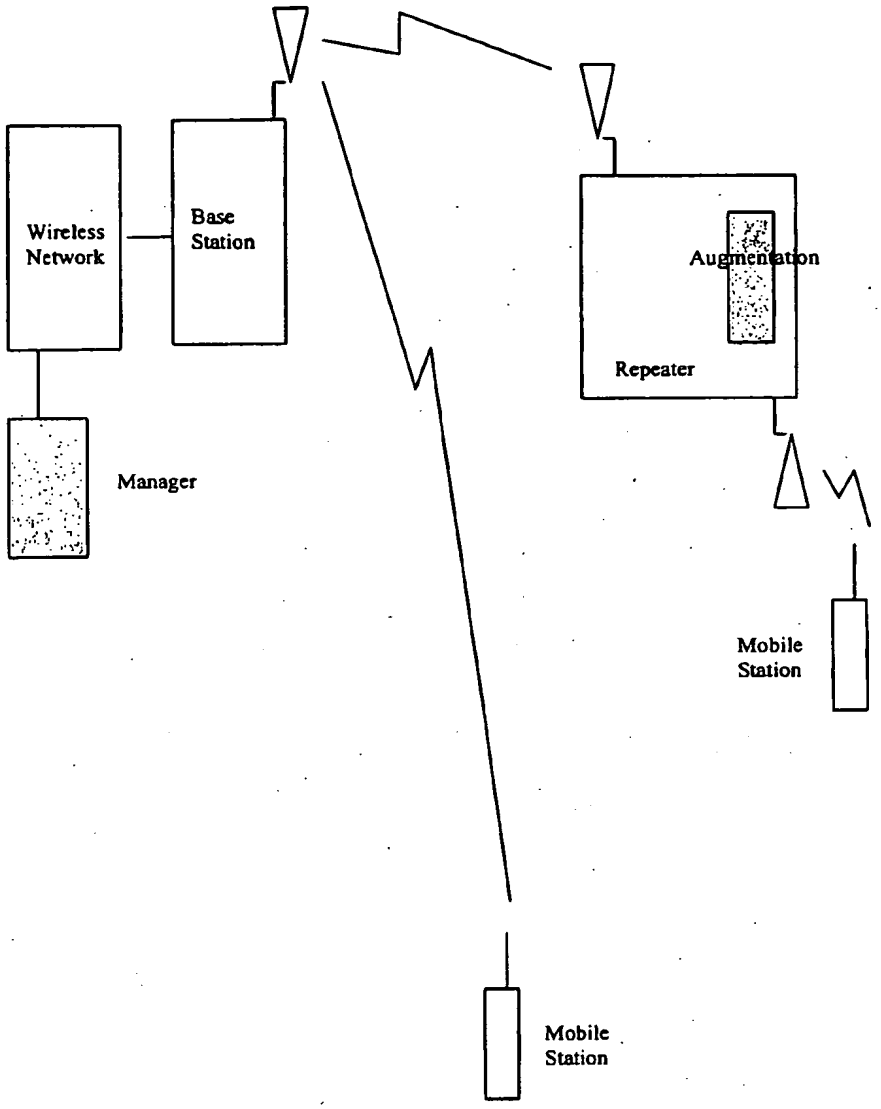
A wireless operator may want to know how a particular mobile appliance is being served in an area to understand how his wireless network is operating, or to size and provision repeaters or other network equipment in an area.

Repeaters are generally deployed in a wireless network in such a way that the network does not know they are present. For example, a repeater may be placed in a building to provide service within the structure. Here, a wireless base station may have a sector that is designed to serve the building, but because of propagation effects, a mobile appliance operating in the building does not have reliable service. A repeater can be added to the building to boost the forward and reverse link signals to an acceptable level. The serving sector does not "know" that the repeater is present, it sends and receives signals in the same way whether a repeater is present or not present. Likewise, the repeater is not aware of what mobile transmissions are being carried through it, or directly to the base station sector.

The base station serving sector may serve mobiles either through the repeater, or directly. The repeater, or set of repeaters, in the sector footprint may be located close to, or far from the base station. The repeaters can provide coverage over a large area or very small targeted area. The repeaters can operate with different power boosting levels and delays. Thus the serving sector has no way of determining the way in which mobiles are served.

Generally, a repeater is installed such that one antenna is placed in a position to have clear view of the base station serving sector antennas (designated the repeater to base station antenna), and one antenna (or set of antennas) are placed to have good coverage for the mobile appliances to be served (designated the repeater to mobile antenna). Electronics are placed between the antennas to amplify and filter the signals.

This invention uses an augmentation to the repeater to determine which mobile appliances are operating through the antenna (see figure).



The augmentation is composed of a scanning receiver and a mechanism for interfacing to a data service used to communicate with the Manager. The augmentation may be housed in the repeater and is connected to the repeater- to- mobile antenna of the repeater. The augmentation scans the reverse link channels where a mobile appliance might transmit and measures energy and/or signal characteristics. These channels can be represented as RF frequencies, time slots, spreading codes or combination thereof. These measurements are made to determine if a mobile appliance is operating in the proximity of the repeater antenna. If signal strength and/or quality are high (or within a certain band), then it is assumed that the mobile is operating through the repeater. The measurements and/or channel indicators for a mobile appliance determined to be operating through the repeater are transmitted to the manager. The measurements may be tested at the augmentation or at the manager. The measurements can be tested based on signal strength, particular band of received power, or signal characteristics. The band of received power may be mapped to the power management algorithms that a particular air interface will employ to control the power level of a mobile

appliance. Decoding of certain signal characteristics (for example, presence of sync codes) can indicate sufficient power level to measure characteristics, and positive indication that the signal energy on that channel is from the a device connected to the wireless network of interest.

The data service is most conveniently a data transport mechanism supported by the wireless network of interest. For example, in a GSM network that supports GPRS, the measurement data from the augmentation or channel results could be transferred to the manager using this data service. SMS services available in TDMA and GSM are also candidates. Wireless connections (e.g. T1, modem, frame relay) are also an option. The manager serves as the control and management device for the augmentation(s), and as an interface point for access to the list of mobile appliances operating through certain repeaters. The manager can have data files indicating where repeaters with augmentations are located in the network, and through connections to other wireless network entities, translate channel information to mobile identity information. In a GSM network, this might consist of translating a traffic channel assignment to a TMSI or MSISDN through access to network data at the BSC or HLR/VLR.

Implementation of the augmentation and manager in this fashion is convenient and cost effective. The functions incorporated into the augmentation for the most part reside in the building blocks found in today's commercial handsets. Thus, the augmentation could be added to a repeater for a fraction of the recurring cost of handset components. The manager could be conceived as a new software component executing on an existing computing device in a wireless network, shared with other functions associated with network entities to which it would be convenient to interface.